PORSF
11.3.42 DRAFT
08/31/2005

LINNTON OIL FIRE TRAINING GROUNDS
CSM Site Summary

LINNTON OIL FIRE TRAINING GROUNDS

Oregon DEQ ECSI #1189

NW Marina Way
DEQ Site Mgr: Tom Gainer
Latitude: 45.6101°
Longitude: -122.79°
Township/Range/Section: 2N/1W/34

River Mile: 3.5 West bank

LWG Member ☒ Yes ☐ No

Upland Analytical Data Status: ☐ Electronic Data Available ☒ Hardcopies only

1. SUMMARY OF POTENTIAL CONTAMINANT TRANSPORT PATHWAYS TO THE RIVER

The current understanding of the transport mechanism of contaminants from the Upper Terrace portion of the Linnton Oil Fire Training Grounds (LOFTG) site to the Willamette River is summarized in this section and Table 1, and supported in the following sections.

1.1. Overland Transport

Currently, there are no known potential overland pathways for transport of contaminants from the site to the river.

1.2. Riverbank Erosion

Not applicable.

1.3. Groundwater

Extensive groundwater monitoring performed at the site has identified the following COIs in groundwater: TPH, PCP, chlorinated VOCs, and arsenic. The general decreasing trend in concentrations of COIs at the site suggests that the groundwater plumes have attenuated since source material was removed during the remedial excavation. This trend will likely continue. In addition, constituent concentrations at the downgradient monitoring points are below respective risk-based concentrations (RBCs) and the leading edges of the plumes are located at least 600 feet from the Willamette River. Thus, potential groundwater impacts at the site are unlikely to be a current or ongoing source of Willamette River water or sediment contamination.

1.4. Direct Discharge (Overwater Activities and Stormwater/Wastewater Systems)

There have not been any over water activities associated with this site. Historically, surface water collecting in a topographically low area of the site (Lower Area) may have periodically discharged to the Willamette River via a series of drainage features (culvert in the gravel road, wetland, swale, culvert in the river embankment) located north of the site. The findings from the Surface Water Pathway Evaluation (BES 2002) indicated low concentrations of PCP and PAHs were detected in shallow soil samples collected along the drainage, suggesting a potentially complete pathway from the site to the river for surface water. However, DEQ also determined that source control measures were not necessary because PAH and PCP levels detected in samples adjacent to the river were below applicable screening levels. There are no known potential surface water pathways for transport of contaminants from the site to the river currently

present since the culvert in the gravel road is plugged (BES 2002) and can no longer convey water.

1.5. *Relationship of Upland Sources to River Sediments*

See Final CSM Update. None identified.

1.6. *Sediment Transport*

Not applicable.

2. CSM SITE SUMMARY REVISIONS

Date of Last Revision: August 31, 2005

3. PROJECT STATUS

Activity		Date(s)/Comments
PA/XPA	☐	
RI	☒	RI and Endangerment Assessment Report (AGI 1995)
FS	☒	Feasibility Study (AGI 1995)
Interim Action/Source Control	☐	
ROD	☒	Signed 5/96 (DEQ 1996)
RD/RA	☒	Remedial Action Final Project Report (AGI 2000)
NFA	☒	DEQ NFA for surface water pathway – NFA for other pathways currently pending DEQ review (DEQ 2004)

DEQ Portland Harbor Site Ranking (Tier 1, 2, 3, or Not ranked): Tier 3

4. SITE OWNER HISTORY

Owner/Occupant	Type of Operation	Years
Bonneville Power Administration (owner)	High-tension power line right-of-way	Prior to 1951 - present
City of Portland (lessee)	Oil fire training ground	1951 - 1988
Olympic Pipeline Company (easement)	Oil and gas pipeline	1964 - present
Unknown	Farmland	1929 – 1940s

5. PROPERTY DESCRIPTION

The LOFTG site is a 1.5-acre site located at approximately RM 3.5 on the west side of the Willamette River, in Township 2 North, Range 1 West, Section 34 (Figure 1). The roughly rectangular site is bordered on the south by the Morse Brothers, Inc. property (formerly owned by Georgia-Pacific, Inc.), on the west by railroad tracks and NW Marina Way, on the north by an east-west trending gravel road and the Portland General Electric (PGE) Harborton Generator Facility, and on the east by vacant Bonneville Power Administration (BPA) property located between the site and the Willamette River. The Willamette River lies approximately 600 feet to the east of the site.

Site elevations range from 40 feet above mean sea level (MSL) in the western portion of the site to 20

feet above MSL, in the east (see Supplemental Figure 2 from CDM [2002]). Site topography consists of two relatively flat terraces separated by a north-south trending embankment approximately 12 to 14 feet high. The Lower Area is the terrace located east and below the embankment and is between 21 and 24 feet MSL. The Upper Terrace, located above and west of the embankment, is between 32 and 36 feet MSL. The Upper Terrace is only sparsely vegetated with assorted grasses and low-lying shrubs, including areas of bare soils. The Upper Terrace slopes to the east and drains to a shallow depression located on its southeast corner; this depression is known as the Upper Pond. Overflow from the Upper Pond has historically drained eastward to a wetland/pond located in the Lower Area, known as the Lower Pond. The Lower Area is currently a closed drainage, apparently created by historical fill placement, which has created the Lower Pond. Stormwater collecting in the Lower Area either evaporates or infiltrates into the ground. Periodic high intensity or long duration runoff events may have resulted in drainage of surface water from the Lower Pond through a culvert across the gravel road prior to at least 3 years ago. A recent investigation of this drainage pathway indicates that the culvert is plugged and is no longer functional (BES 2002). The Lower Area is densely vegetated with blackberry brambles and scattered trees (AGI 1995).

The Linnton community lies 0.5 mile south of the site. A petroleum pipeline, owned by Olympic Pipeline, crosses the southwest corner of the site and runs in a north-south direction (AGI 1995). An additional petroleum pipeline, owned by PGE, crosses the center of the site in a north-south direction. After crossing the site, this pipeline turns towards the east and is located parallel to the asphalt road on Morse Brothers Property just south of an oil vault located west of the Upper Pond (CDM 2004).

6. CURRENT SITE USE

The LOFTG site is currently vacant except for a gravel drive (approximately 200 feet in length and running east-west) and the underground pipelines.

7. SITE USE HISTORY

Historical information for the LOFTG site was obtained from the Remedial Investigation and Endangerment Assessment Report (AGI 1995).

Aerial photos show that the site was under cultivation from 1929 to the 1940s. BPA purchased the site sometime later to obtain right-of-way for their high-tension power lines. In 1951, BPA leased a portion of their property to the City of Portland's Bureau of Fire, Rescue, and Emergency Services for use as an oil firefighting training area. Fire-training exercises occurred through 1988, which involved various props that were ignited and extinguished. Props included a concrete basin, fueling rack, aboveground tanks, various shaped buildings, and semi-trailers. Petroleum products such as diesel fuel, gasoline, bunker oil, other oils, lacquers, and other wastes were supplied by area businesses. Heavier oils were not used because of ignition problems. Water was the primary extinguishing agent, although other dry chemical agents and foams were sometimes used including sodium bicarbonate, monosodium phosphate, and water-soluble protein-based compounds.

Two 3,000-gallon underground storage tanks (USTs) used to store diesel fuel were located in the northwest corner of the property. These USTs were decommissioned and removed in 1990 (AGI 1995). Refer to Section 9.1.1 for additional information regarding soil investigation results related to the UST decommissioning.

Unburned products, burned residues, extinguishing agents, and water either infiltrated into the ground or flowed into the former concrete basin and/or into the drainage ditch located along the southern property line. This drainage ditch routed the runoff to the Upper Pond. Any overflow from the Upper Pond flowed through a discharge pipe down the slope to the Lower Pond. Based on the findings from the Surface Water Pathway Evaluation (BES 2002) and soil sampling (BES 2004a, 2004b), a potentially

complete surface water pathway was identified from the Lower Area to the Willamette River via a culvert in the gravel road to the north of the site, to a wetland which drains to swale that discharges to the river. Surface water from the site no longer discharges along this pathway because the culvert is plugged and no longer functional. Refer to Section 10.3.1 for additional information regarding stormwater investigation activities conducted at the site. The site has been vacant since 1988.

8. CURRENT AND HISTORIC SOURCES AND COPCS

The understanding of historic and current potential upland and overwater sources at the site is summarized in Table 1. The following sections provide a brief overview of the potential sources and COPCs at the site.

8.1. Uplands

Potential historic sources investigated include those associated with activities related to oil firefighting training, including locations where petroleum products and fire retardants where used. Historical source areas identified during multiple phases of environmental investigation include the Main Training Area, the Upper Pond and the Lower Pond. COPCs include TPH, PAHs, VOCs, PCP, and metals (arsenic, lead, and nickel). The primary source of contamination at the site was eliminated when fire training ceased. Areas of contaminated soil acted as secondary sources during and after cessation of fire training. With minor exceptions where access was not feasible, remedial excavation activities have removed the secondary historical sources.

8.2. Overwater Activities

☐ Yes ☒ No

No overwater activities have been associated with this site.

8.3. Spills

No known or documented spills were found in DEQ's Emergency Response Information System (ERIS) database for the period of 1995 to 2004, in DEQ correspondence, or in oil and chemical spills recorded from 1982 to 2003 by the U.S. Coast Guard and the National Response Center's centralized federal database [see Appendix E of the Portland Harbor Work Plan (Integral et al. 2004)], or in facility-specific technical reports.

9. PHYSICAL SITE SETTING

A description of the current site topography is provided in Section 5. Several subsurface investigations have been completed at the site. Explorations completed at the site included test pits, soil borings, and groundwater monitoring wells. The RI/FS Report (AGI 1995) and the latest groundwater monitoring report (CDM 2004) were the primary sources of geologic/hydrogeologic information for this summary.

9.1. Geology

The geologic materials encountered beneath the site consist of Pleistocene and Recent Alluvial deposits. The stratigraphy beneath the Upper Terrace area consists of interbedded layers of sandy silt and silty sand to the total depth explored (approximately 50 feet). Sandy silt predominates to a depth of approximately 15 feet, below which silty sand layers become common, but do not appear to be laterally continuous (AGI 1995).

The lower terrace area is underlain by 2 to 3 feet of sandy silt over approximately 15 to 20 feet of clayey silt. Interbedded silty sand and sandy silt is present beneath the clayey silt. The upper silty sand and the clayey silt both contain abundant organic matter. The interbedded silty sand and sandy silt extend to the total depth explored (approximately 50 feet) (AGI 1995).

Based on a review of well logs in the area, it is likely that the interbedded silty sand and sandy silt deposits extend to depths of more than 100 to 150 feet (AGI 1995).

9.2. Hydrogeology

Twelve shallow monitoring wells are currently present at the site. The depth to shallow groundwater generally ranges from 1 to 5 feet bgs. During the spring, shallow groundwater at the site flows northeast toward the Willamette River. In the fall (October data), the groundwater flow direction appears to shift towards a more easterly direction [see Supplemental Figures 3 and 4 from CDM (2004)].

The horizontal hydraulic conductivity of the shallow groundwater aquifer beneath the site ranges between 0.004 ft/day (4x10-5 cm/s) to 0.01 ft/day (9x10-5 cm/s) based on slug test results (AGI 1995). DEQ concludes in the Record of Decision (ROD) that groundwater flow velocities beneath the site are low (DEQ 1996).

10. NATURE AND EXTENT (*Current Understanding*)

10.1. Soil

10.1.1. Upland Soil Investigations

☒ Yes ☐ No

Several phases of investigation have been completed at the site beginning in 1988. The majority of investigation was completed during the RI/FS (AGI 1995). Soil data have been collected from approximately 10 test pits, 22 investigative borings, and several surface samples located throughout the site. Soil borings were completed to a maximum depth of approximately 50 feet bgs.

Organic chemicals detected at the site fall into three categories: those associated with fuel hydrocarbons (TPH, aromatic VOCs, and PAHs), PCP, and chlorinated VOCs. Evidence of fuel hydrocarbons was found in surface and subsurface soil near the Main Training Area (located in the Upper Terrace), the former drainage ditch, and the Upper and Lower ponds. Detectable concentrations of fuel hydrocarbons in these areas extended from the ground surface to approximately 2 to 4 feet below the shallow groundwater surface. Evidence of fuel hydrocarbon impacts was also identified in subsurface soils in three other areas including: (1) the northwest portion of the site, in the vicinity of monitoring well MW-1; (2) the north-central portion (soil boring TB-8 area); and (3) the west-central portion of the Lower Area in the vicinity of test pit TP-5. The maximum aromatic VOC concentrations detected at the site were in subsurface soil in the Main Training Area. Maximum PAH concentrations were detected in subsurface soil in the Main Training Area and the Lower Pond Area.

Other chemicals have been detected in areas with petroleum hydrocarbon staining, including PCP and chlorinated VOCs. PCP was detected in soil samples collected from hydrocarbon-stained areas in the Main Training Area at concentrations of up to 80 mg/kg.

Evidence of chlorinated VOCs impacts was identified principally in surface and subsurface soils located in the Main Training Area, along the former drainage ditch, and in the Upper Pond (DEQ 1996). The maximum chlorinated VOC concentrations were detected in subsurface soil in the area of the former drainage ditch.

Lead and nickel were detected at the site in surface soils in the Main Training Area; concentrations of lead and nickel decrease significantly with depth. Arsenic was also identified at the site and is believed to be naturally-occurring arsenic that was leached out of soils, possibly by phosphate-based extinguishing agents or reducing conditions due to the presence of petroleum hydrocarbons (DEQ 1996).

In 1990, two 3,000-gallon underground storage tanks used to store diesel fuel were removed from the site. These tanks were located in the northwest corner of the property. Based on soil sampling results, the DEQ issued a no further action determination for the tank decommissioning (AGI 1995).

In 1998, as part of the remedial actions phase, 4,320 cubic yards of contaminated soil at the site was transported to an offsite facility and treated by low temperature thermal desorption. The treated soil was returned to the site and used as backfill. Residual-impacted soil with constituent concentrations exceeding site-specific target levels listed in the ROD (DEQ 1996) was identified in areas where excavation was not feasible (i.e., pipeline or property boundary), and in the upper pond area. Supplemental Figure 5 from AGI (2000) shows the location of the residual-impacted soil at the site and concentration data. Based on verification sampling data, the DEQ determined that no further excavation was required at the site and that the minor residual soil contamination may be managed in-place through site use controls and groundwater monitoring (AGI 2000).

A summary of detected constituents in residual-impacted soil is provided in the following table (AGI 2000):

Analyte	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)
Total Petroleum Hydrocarbons (TPH)		
Diesel	<25	31,000
Heavy Oil	<50	1,400
Volatile Organic Compounds (VOCs)		
Benzene	<0.1	1.3
Ethylbenzene	<0.1	5.7
Toluene	<0.1	0.21
Total Xylenes	<0.1	9.9
1,1,1 Trichloroethane	<0.1	2.6
Polycyclic Aromatic Hydrocarbons (PAHs)		
Benzo(a)anthracene	<0.1	3.51
Benzo(b)fluoranthene	<0.1	0.126
Benzo(k)fluoranthene	<0.1	0.12
Chrysene	<0.1	6.47

mg/kg = milligrams per kilogram (ppm)

As part of the Surface Water Pathway Evaluation, the presence of PCP and PAHs was detected in soil along an offsite drainage system. Refer to Section 10.3.1 for a summary of the evaluation and soil sampling results.

10.1.2. Riverbank Samples

☒ Yes ☐ No

Riverbank samples were collected at the site as part of the Surface Water Pathway Evaluation conducted after remedial actions were completed (BES 2002, 2004a, 2004b). Six soil samples were collected along the riverbank at depths ranging from 0 to 0.5 feet bgs. Refer to Section 10.3.1 for additional information.

10.1.3. Summary

Characterization of soil conditions at the site has been performed using data collected from test pits, investigative borings, and surface soil sampling. Soil COIs identified during the

RI include TPH, PCP, VOCs, and metals (lead, nickel, and arsenic). Most of the contaminated soil identified at the site has been excavated and treated as described in Section 11.1. Only isolated pockets of soil contamination exist in areas where excavation was not feasible (i.e., pipeline or property boundaries). In 1998, the DEQ reviewed the confirmation sampling data and indicated that no further excavation is required at the LOFTG site (AGI 2000).

10.2. Groundwater

10.2.1. Groundwater Investigations

☒ Yes ☐ No

Extensive groundwater monitoring has been conducted at the site as early as 1991 beginning with seven monitoring wells. Twelve monitoring wells are currently present at the site. Groundwater monitoring has been conducted on a semiannual basis since November 1999. Groundwater samples collected from the wells have been analyzed for TPH, PAHs, PCP, VOCs, and arsenic (CDM 2004).

10.2.2. NAPL (Historic & Current)

☐ Yes ☒ No

Non-aqueous phase liquid (NAPL) has not been observed in any of the LOFTG borings or monitoring wells.

10.2.3. Dissolved Contaminant Plumes

☒ Yes ☐ No

Groundwater investigation activities have identified two groundwater plumes at the site: one consisting of gasoline, diesel, and heavy-oil range petroleum hydrocarbons and another of chlorinated VOCs. Arsenic also has been detected in groundwater at several monitoring well locations using total and dissolved metals analyses. The RI indicates that phosphate-based extinguishing agents used at the site may have selectively leached naturally occurring arsenic from the soil, enriching concentrations of arsenic in groundwater (AGI 1995). In addition, two isolated areas of groundwater with PCP concentrations have been identified at the site.

Plume Characterization Status ☒ Complete ☐ Incomplete

Extensive groundwater monitoring has been completed at the site commencing in 1991. The DEQ has indicated that the nature and extent of petroleum hydrocarbon-related contamination in groundwater at the site is well defined (DEQ 1996). Semiannual groundwater monitoring has been conducted since November 1999 (CDM 2004), and constituent concentrations detected in the groundwater samples have exhibited a continued decline since implementation of remedial excavation activities.

Plume Extent

Based on the April 2004 groundwater monitoring data, the petroleum hydrocarbon plume primarily occupies the Upper Terrace but also appears to extend into a portion of the Lower Area. Based on the presence of low concentrations of TPH detected at monitoring well MW-10, the plume also extends a limited distance offsite to the vicinity of the gravel road located north of the site. Based on a review of the groundwater data by the City, the leading edge of the TPH plume is estimated to be at least 600 feet from the Willamette River. Two isolated locations of PCP were detected at monitoring wells MW-10 and MW-14. The chlorinated VOC plume appears to be limited to the Upper Terrace in the southeastern portion of the site. The leading edge of this plume is estimated to be at least 800 feet from the Willamette River. In addition, the sizes of these plumes are generally anticipated to decrease over time based on the trend of decreasing concentrations shown in the data. These conclusions are consistent with the five-year review report for the site that is currently being finalized.

Min/Max Detections (Current situation)

The following table summarizes the recent groundwater analytical results for the April 2004 monitoring event (CDM 2004). Earlier monitoring data are included for wells/constituents not sampled during the April 2004 monitoring event.

Analyte	Minimum Concentration (µg/L)	Maximum Concentration (µg/L)
Total Petroleum Hydrocarbons (TPH)		
Gasoline	<80	2,170
Diesel	<250	6,340
Heavy Oil	<500	793
Volatile Organic Compounds (VOCs)		
1,1-Dichloroethene	<2.0	7.16
1,2,4-Trimethylbenzene	<1.0	6.24
1,2-Dichloroethane	<1.0	10.1
1,3,5-Trimethylbenzene	<1.0	3.58
Benzene	<1.0	67.8
n-Propylbenzene	<1.0	118
Vinyl Chloride	<1.0	2.4
Polycyclic Aromatic Hydrocarbons (PAHs)		
Acenaphthene	<1.0	1.70
Anthracene	<1.0	0.426
Fluoranthene	<1.0	0.227
Fluorene	<1.0	3.44
Naphthalene	<1.0	8.41
Phenanthrene	<1.0	1.90
Pyrene	<1.0	0.189
Dissolved Metals		
Arsenic	0.31	68.8
Other		
Pentachlorophenol	<1.0	9.86

Current Plume Data

Figure 2 shows the estimated lateral extent of the identified groundwater plumes at the site.

Preferential Pathways

Two subsurface pipelines were identified as potential preferential pathways at the site. One pipeline, owned by Olympic Pipeline, generally trends northwest-southeast crossing the tip of the southwest corner of the site. Based on subsequent investigations, this pipeline does not appear to be a preferential groundwater pathway of concern since the identified plumes are located downgradient of the pipeline. The other pipeline, owned by PGE, trends northwest-southeast through the center of the site. This pipeline is generally located perpendicular to the groundwater flow direction, which would have the potential to increase the width of any groundwater plumes. Although the pipeline bisects the TPH plume and the chlorinated VOC plume, the widths of the plumes do not appear to be unusually disproportionate relative to the plume lengths, suggesting that this pipeline is not a preferential pathway of concern. No other subsurface utility corridors that could potentially be a preferential pathway for groundwater flow were identified at the site (AGI

1995).

Downgradient Plume Monitoring Points (min/max detections)

The downgradient extents of existing plumes have been evaluated for two conditions in 2002: (1) in the spring when groundwater levels are relatively high and flow is in a northerly direction, and (2) in the fall, [see Supplemental Figure 4 from CDM (2002)] when groundwater levels are relatively low and flow is in a northeasterly direction [see Supplemental Figure 3 from CDM (2002)]. During spring 2002 conditions, monitoring well MW-7 defined the downgradient extent of the identified groundwater plumes. Groundwater data collected from MW-7 indicated mostly no detections of COIs or concentrations of COIs below the risk based concentrations (RBCs) established in the endangerment assessment as part of the RI (AGI 1995).

In fall 2002 conditions, MW-7 also defines the downgradient extent of the petroleum hydrocarbon plume. Data from MW-9, MW-10 and MW-13 indicate that these wells were located near the edges of the plume. Recent groundwater monitoring data from 2004 indicate concentrations of diesel of 2.94 mg/L and 4.95 mg/L for monitoring wells MW-9 and MW-13, respectively. Concentrations of PAHs detected at the downgradient monitoring points are below the RBCs. No PCP or chlorinated VOCs were detected in the samples collected from both of these wells. Low concentrations of aromatic VOCs were detected at MW-13 (benzene at 1.82 µg/L, and n-propylbenzene at 2.72 µg/L), and are at levels below the RBCs. Downgradient monitoring points MW-9 and MW-13 are greater than 600 feet from the Willamette River.

Visual Seep Sample Data

☐ Yes ☒ No

Seepage was observed during the Portland Harbor RI/FS seep reconnaissance survey (GSI, 2003) at the base of the embankment adjacent to the PGE property. Later observations identified a metal culvert at the head of a rivulet originating at the bank in the vicinity of the seep. DEQ indicated that this culvert may have received runoff from the LOFTG site. DEQ requested a surface water pathway evaluation (DEQ 2003) based on the presence of the culvert. The results of the evaluation are presented in Section 10.3.1. No other seeps associated with the site have been noted.

Nearshore Porewater Data

No near shore porewater data are available.

Groundwater Plume Temporal Trend

Based on a review of the data by the City, concentrations of TPH, PAHs, PCP, VOCs, and arsenic detected in groundwater samples collected at the site have decreased over time overall, with periodic exceptions. Concentrations of TPH (diesel and heavy-oil range) and benzene appear to have increased at monitoring well MW-2. However, concentrations of PAHs have decreased at this well. Concentrations of TPH (gasoline range) appear to have increased at monitoring well MW-13. However, concentrations of VOCs including gasoline related constituents have decreased at this well. The overall decreasing concentration trends in the data indicate that the groundwater plumes have attenuated and will likely continue to attenuate over time since the soil source areas have been mostly removed.

10.2.4. Summary

Groundwater monitoring has been performed from 12 monitoring wells located throughout the site. COIs identified in groundwater include TPH, PAHs, PCP, VOCs, and arsenic. Based on the April 2004 groundwater monitoring data, the TPH plume primarily occupies

the Upper Terrace. A small portion of the plume extends offsite across the northern site boundary to the gravel road. Only two wells had detections of chlorinated VOCs during the recent event, indicating that this plume does not extend beyond the Upper Terrace. PCP was also detected at two wells but the wells are located at opposite sides of the site, suggesting that the PCP impacts are limited in extent and isolated. Arsenic has been detected in groundwater at the site but appears to be a result of leaching of naturally-occurring arsenic concentrations in soil due to the use of phosphate-based extinguishing agents at the site and/or reducing conditions associated with the presence of petroleum-related constituents.

Based on a review of the data by the City, the general decreasing trend in concentration of COIs at the site suggests that the groundwater plumes have attenuated and will likely continue to attenuate since source material was removed during the remedial excavation. In addition, recent groundwater monitoring data indicates constituent concentrations at the downgradient monitoring points are below the respective RBCs. The leading edges of the plumes are located at least 600 feet from the Willamette River. Thus, potential groundwater impacts at the site are an unlikely current or ongoing source of Willamette River water or sediment contamination. DEQ will be conducting a 5-year groundwater monitoring review to confirm that the site is not a current source of contamination to the river via the groundwater pathway (DEQ 2004).

10.3. Surface Water

10.3.1. Surface Water Investigation

☒ Yes ☐ No

No surface water samples have been collected at the site. However, a surface water pathway evaluation was conducted using data collected from soil samples. Seepage was observed during the Portland Harbor RI/FS seep reconnaissance survey (GSI 2003) at the base of the embankment adjacent to the PGE property. Later observations identified a metal culvert at the head of a rivulet originating at the bank in the vicinity of the seep. DEQ indicated that this river embankment culvert may have received runoff from the LOFTG site. DEQ requested a surface water pathway evaluation (DEQ 2003) based on the presence of the river embankment culvert.

A culvert that bisects the east-west trending gravel road located just north of the LOFTG site, was identified during the Surface Water Pathway Evaluation. In May 2002, the gravel road culvert was observed to be plugged but historically may have periodically conveyed surface water from the Lower Area of the LOFTG site to a wetland located offsite and northeast of the site, such as during high intensity or long-duration rainfall events. There is no defined drainage feature on the downstream end of gravel road culvert; any water flowing from the LOFTG site through the culvert likely sheet flowed across the soil before draining northwest to a small swale fed by a seasonal Forest Park stream. The swale parallels the PGE Harborton site then apparently drains through the river embankment culvert.

As part of the Surface Water Pathway Evaluation, BES performed three phases of soil sampling (November 2002, November 2003, and June 2004) using a hand auger to assess conditions at depths ranging from 0 to 2.5 feet bgs. A total of 16 soil samples were collected along the drainage system and riverbank and analyzed for PAHs and PCP. The sample locations are shown on Supplemental Figure from BES (2004b). Of the 7 samples with PCP detections, the maximum concentration was 6.87 mg/kg. PCP was detected at a concentration of 1.08 mg/kg in one sample (LOFTG6), collected adjacent to the river embankment culvert. However, subsequent sampling to confirm the presence and assess the extent of PCP in the vicinity of the LOFTG6 indicated no detections of PCP in any of five additional samples. Of the 10 samples with detections of PAHs, the maximum

concentration of benzo(a)pyrene was 1.3 mg/kg. Concentrations of PCP and PAHs detected in soil samples collected closest to the river (at the end of the drainage ditch and along the riverbank) were below the DEQ's screening levels (DEQ Level II Screening Level, Consensus Based Probable Effect Concentration, and DEQ Risk Based Concentration (residential)).

Based on the results from the Surface Water Pathway Evaluation, the DEQ determined the presence of a complete pathway from the site to the river; however, DEQ determined that source control measures are not necessary because PAH and PCP concentrations near the river were below screening levels (DEQ 2004). Currently, there are no known potentially complete surface water contaminant pathways from the site to the river since the culvert located beneath the gravel road has not functioned for at least three years (BES 2002).

10.3.2. General or Individual Stormwater Permit [Current or Past] ☐ Yes ☒ No

Do other non-stormwater wastes discharge to the system? ☐ Yes ☒ No

10.3.3. Stormwater Data ☐ Yes ☒ No

10.3.4. Catch Basin Solids Data ☐ Yes ☒ No

10.3.5. Wastewater Permit ☐ Yes ☒ No

10.3.6. Wastewater Data ☐ Yes ☒ No

10.3.7. Summary

Historically, surface water collecting in the Lower Area may have discharged to the Willamette River via a series of drainage features (gravel road culvert, wetland, swale, and river embankment culvert) located north of the site. The results from the Surface Water Pathway Evaluation (BES 2002) indicate PCP and PAHs in shallow soil samples collected along the drainage was a potentially complete pathway from the site to the river for surface water. However, DEQ also determined that source control measures were not necessary because PAH and PCP levels detected in samples adjacent to the river were below applicable screening levels. Currently, there are no known potential surface water pathways for transport of contaminants from the site to the river since the gravel road culvert immediately adjacent to the LOFTG site has not functioned for at least three years.

10.4. Sediment

10.4.1. River Sediment Data ☐ Yes ☒ No

10.4.2. Summary

The LOFTG property is landlocked and is located approximately 500 feet west of the Willamette River. In addition, there have not been any over water activities associated with this site.

11. CLEANUP HISTORY AND SOURCE CONTROL MEASURES

11.1. Soil Cleanup/Source Control

In 1990, two 3,000-gallon underground storage tanks used to store diesel fuel were decommissioned and removed from the site. These tanks were located in the northwest corner of the property. Based on soil sampling results, the DEQ issued a no further action determination for the tank decommissioning (AGI 1995).

In 1998, as part of the remedial actions phase, 4,320 cubic yards of contaminated soil at the site

was transported to an offsite facility and treated by low temperature thermal desorption. The treated soil was returned to the site and used as backfill. Excavation of petroleum-contaminated soil was estimated to extend to a depth of 8 feet below ground surface (bgs) in the main area of the Upper Terrace, Upper Pond, and Lower Pond. Excavation of soil contaminated with VOCs was estimated to extend to a depth of 15 feet bgs along the southern boundary of the upper terrace. Verification sampling was done on the excavated areas at a rate of one sample every 900 feet with special attention to stained areas. In areas where the sample results showed cleanup levels had not been achieved, addition excavation was performed and additional sampling was required until cleanup levels were met. Residual-impacted soil with constituent concentrations exceeding site-specific target levels was identified in areas where excavation was not feasible (i.e., pipeline or property boundary), and in the Upper Pond area. Based on verification sampling data, the DEQ determined that no further excavation was required at the site and that the minor residual soil contamination may be managed in-place through site use controls and groundwater monitoring (AGI 2000).

11.2. Groundwater Cleanup/Source Control

During remedial excavation activities, several excavations required dewatering. Approximately 60,000 gallons of water was pumped from the excavations and transported to an offsite disposal facility (AGI 2000).

11.3. Other

A deed restriction for site institutional controls has been negotiated with the City of Portland and BPA (DEQ 2004).

11.4. Potential for Recontamination from Upland Sources

See Final CSM Update.

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Figures:

Figure 1. Site Features
Figure 2. Extent of Impacted Groundwater

Tables:

Table 1. Potential Sources and Transport Pathways Assessment

Supplemental Figures:

Figure 2. Monitor Well Locations (CDM 2002)
Figure 3. Groundwater Elevation Map, October 18, 2001 (CDM 2002)
Figure 4. Groundwater Elevation Map, April 18, 2002 (CDM 2002)
Figure Stormwater Pathway Investigation Soil Sample Locations (BES 2004b)

FIGURES

Legend

Round 1 and Historical Samples Not Queried for Inclusion in Table 2

- Round 1 Sediment Samples
- Historical Sediment Samples

Linnton Oil Fire Training Grounds 1189

Georgia-Pacific - Linnton Fiber Terminal 2370

Morse Brothers 0

WR-153

WR-239

WR-238

WR-237

WR-81

-35

ST HELENS RD

MARINA WAY

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\Conseptual_Site_Model\Sample_Locations_3rd_Group.mxd)
Plot Date: 07/05/2005

Areal Photo Date: October 2001.
Base Map features from Portland Metro's RLIS.

Outfall information contained on this map is accurate according to available records; however, the City of Portland makes no warranty, expressed or implied, as to the completeness or accuracy of the information published (updated June 2005).

Legend

- Outfalls
- Seep Photo Location (Not location of actual Seep)
- Selected ECSI Site Property Boundary
- Navigation Channel
- Docks & In-water Structures
- River Miles
- -35ft. Contour (NAVD 88)

Human Use Areas

- Dockside Worker
- Recreational Beach Use
- Transient

LWG Round 2 Proposed Sediment Samples

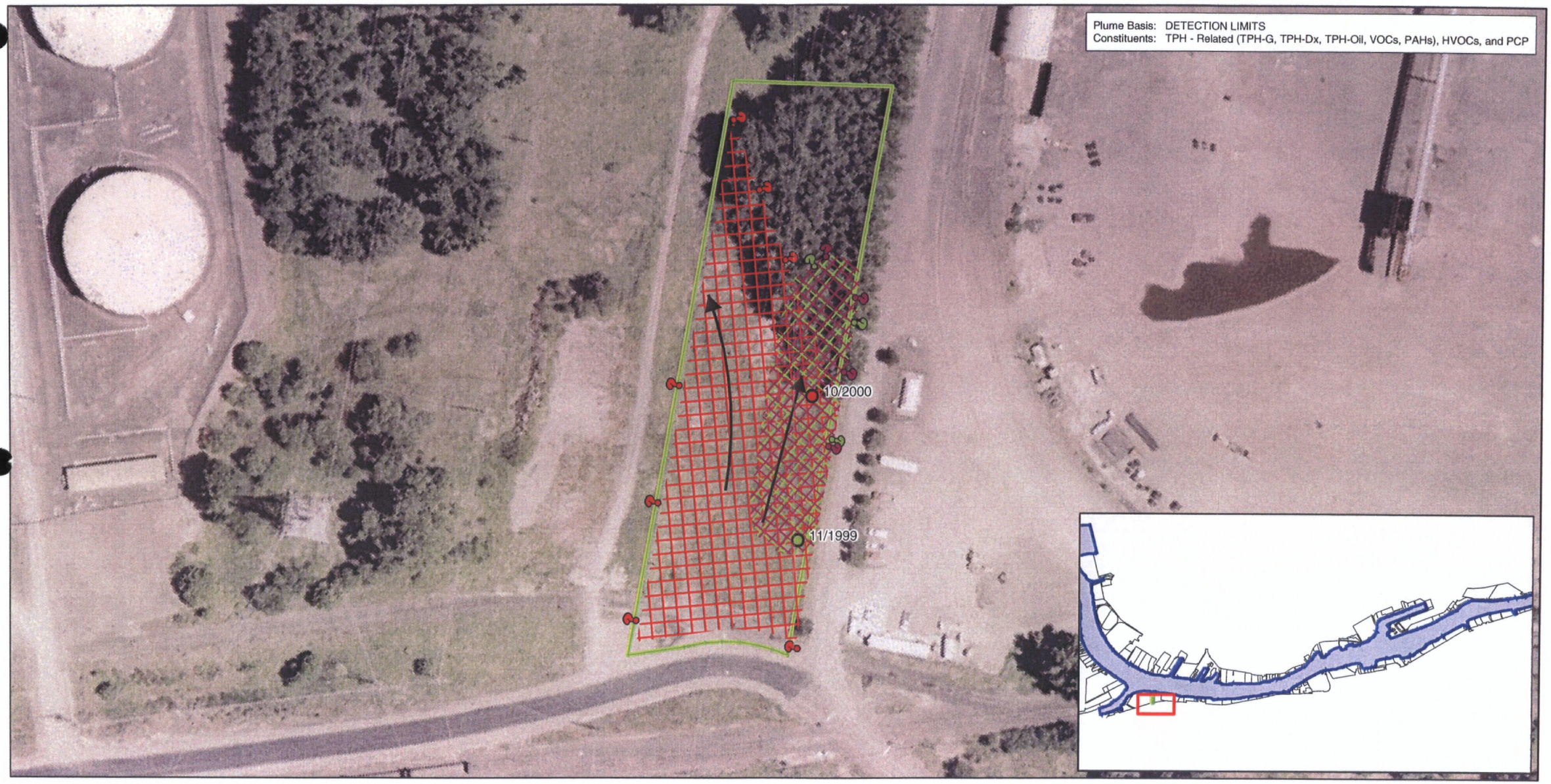
- Surface Sample Only
- Core & Surface Sample

0 50 100 200 Feet

DRAFT

DO NOT QUOTE OR CITE. This document is currently under review by US EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Figure 1-Site Features
Portland Harbor RI/FS
Conceptual Site Model
Linnton Oil Fire Training Ground
ECSI 1189



Groundwater Solutions Inc.

LWG LOWER WILLAMETTE GROUP

0 100 200 Feet

FEATURE SOURCES:
Transportation, Water, Property, Zoning or Boundaries: Metro RLIS.
ECSI site locations were summarized in December, 2002 and January, 2003 from ODEQ ECSI files.

Map Creation Date: August 11, 2004

File Name: Fig2_LinntonFire_SummaryMap.mxd

LEGEND

- Site Boundary
- Maximum Detection Location
- General Groundwater Flow

Contaminant Type

- Petroleum related
- VOCs and PCP
- SVOCs

Extent of Impacted Groundwater

For details, refer to plume interpretation table in CSM document.

- Single or isolated detection of COI's. Extent or continuity of impacted groundwater between sample points is uncertain. Color based on contaminant type.
- Estimated extent of impacted groundwater area. Color based on contaminant type.

Figure 2
Portland Harbor RI/FS
Linnton Oil Fire Training Grounds
Upland Groundwater Quality Overview

TABLES

Table 1. Potential Sources and Transport Pathways Assessment

Linnton Oil Fire Training Grounds #1189

Table 1. Potential Sources and Transport Pathways Assessment

Potential Sources	Media Impacted					COIs																Potential Complete Pathway				
						TPH			VOCs																		
Description of Potential Source	Surface Soil	Subsurface Soil	Groundwater	Catch Basin Solids	River Sediment	Gasoline-Range	Diesel - Range	Heavier - Range	Petroleum-Related (e.g. BTEX)	VOCs	Chlorinated VOCs	SVOCs	PAHs	PCP	Phenolics	Metals	PCBs	Herbicides and Pesticides	Dioxins/Furans	Butyltins	Overland Transport	Groundwater	Direct Discharge - Overwater	Direct Discharge - Storm/Wastewater	Riverbank Erosion
Upland Areas																										
Current																										
Residual contaminated soil left in-place after remedial excavation		✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓		✓										
Historic																										
Main Training Area, Former Drainage Ditch, Upper Pond, Lower Pond	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓		✓										
Surface water originating from the site that historically discharged to the river via the drainage system located north of the site	✓												✓	✓										✓	
Overwater Areas																										
Other Areas/Other Issues																										

Notes:

All information provided in this table is referenced in the site summaries. If information is not available or inconclusive, a ? may be used, as appropriate. No new information is provided in this table.

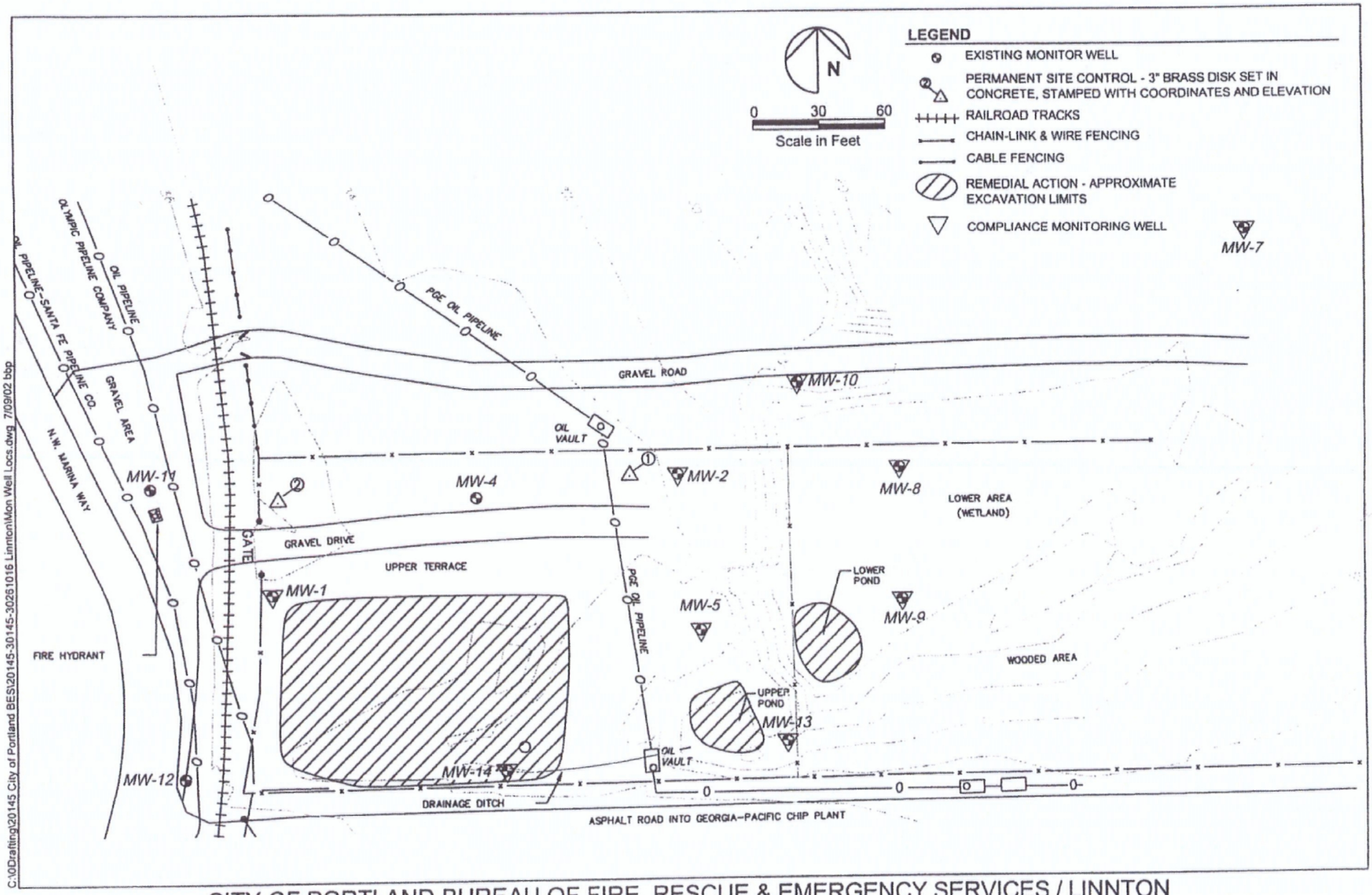
✓ = Source, COI are present or current or historic pathway is determined to be complete or potentially complete.

? = There is not enough information to determine if source or COI is present or if pathway is complete.

Blank = Source, COI and historic and current pathways have been investigated and shown to be not present or incomplete.

UST Underground storage tank
AST Above-ground storage tank
TPH Total petroleum hydrocarbons
VOCs Volatile organic compounds
SVOCs Semivolatile organic compounds
PAHs Polycyclic aromatic hydrocarbons
BTEX Benzene, toluene, ethylbenzene, and xylenes
PCBs Polychlorinated biphenols

SUPPLEMENTAL FIGURES



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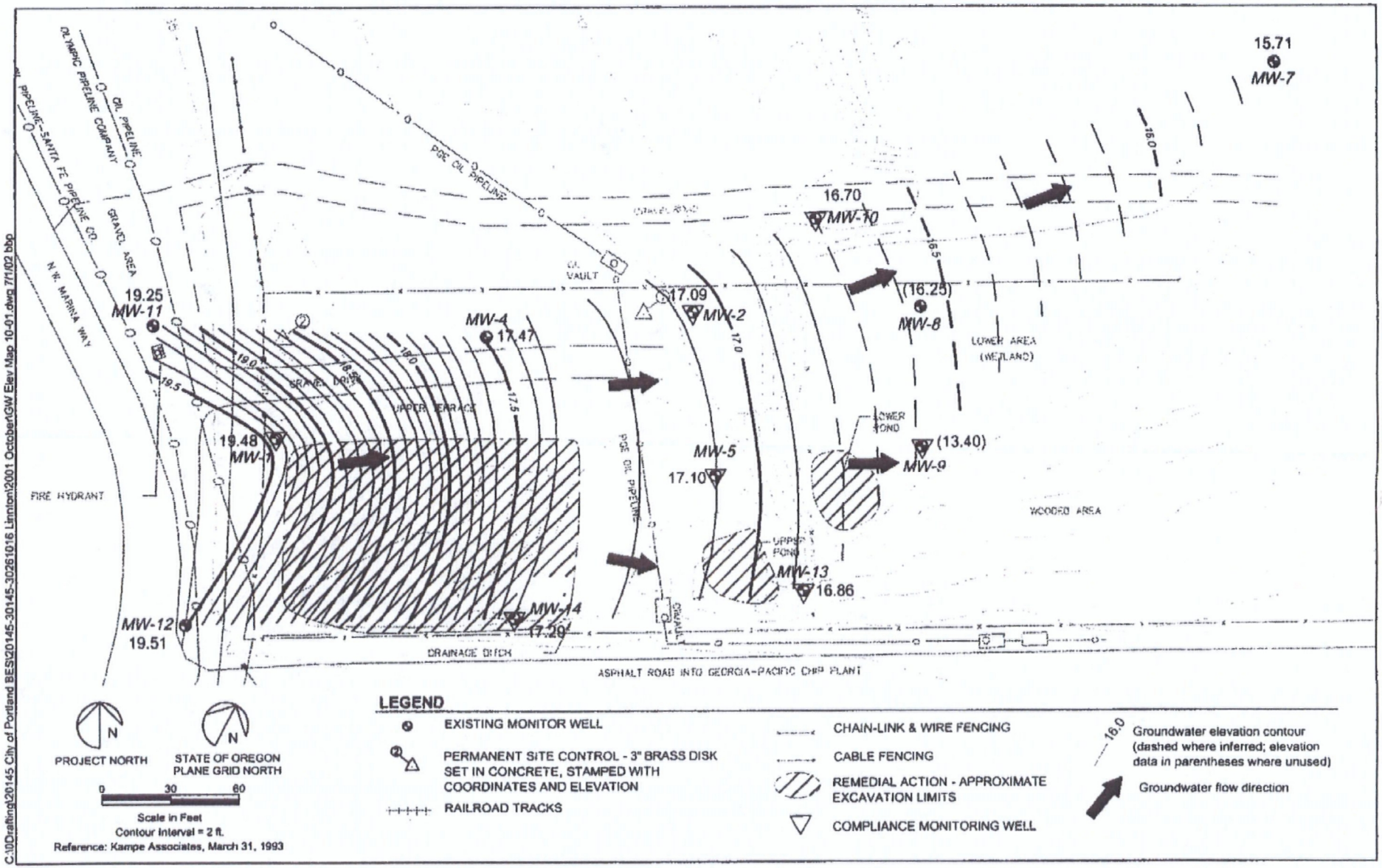
PORTLAND, OREGON

FIGURE 2
MONITOR WELL LOCATIONS

CDM



C:\10Drafting\20145 City of Portland BES\20145-30145-30261016 Linnton\2001 October\GW Elev Map 10-01.dwg 7/1/02 bbp

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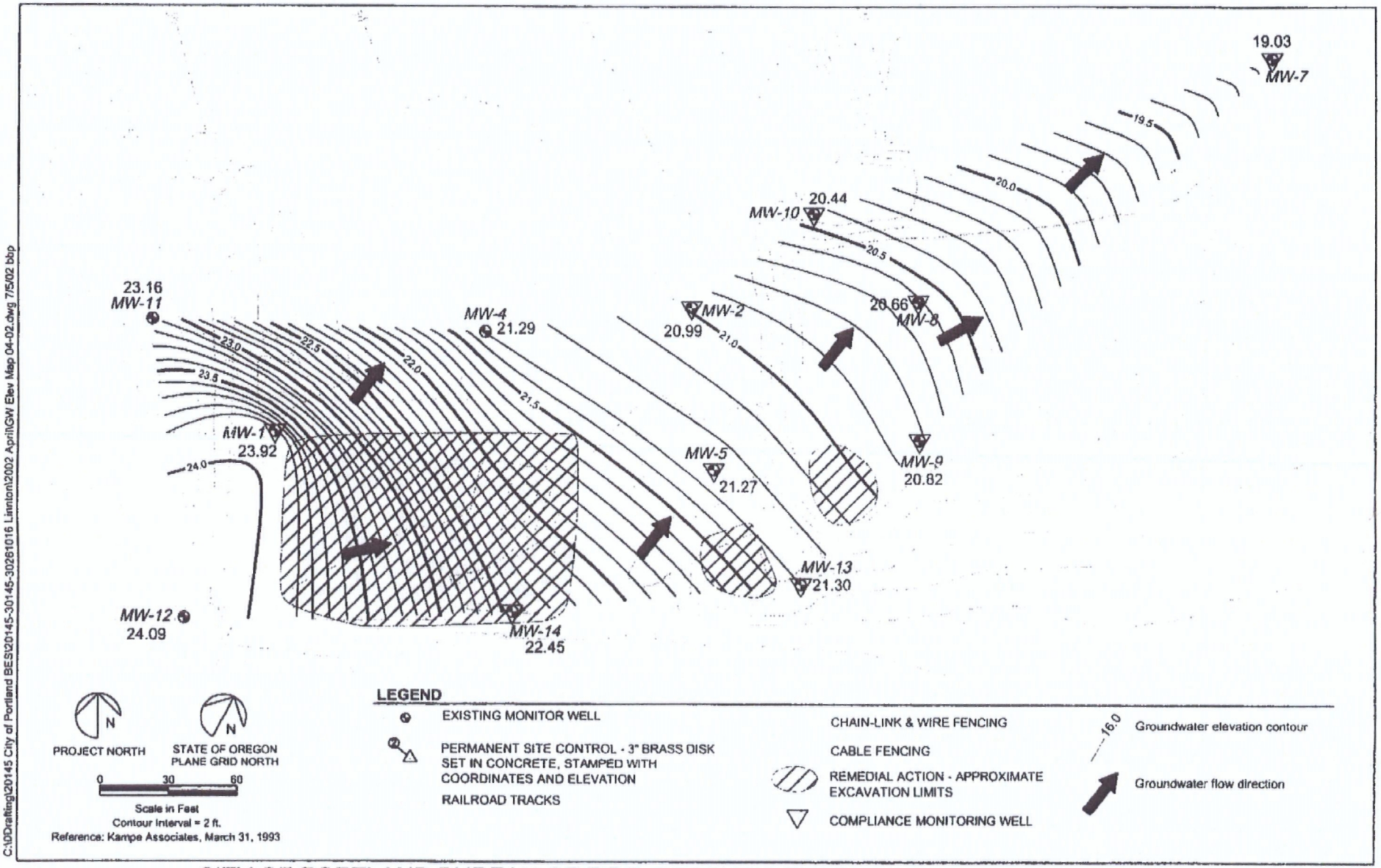
FIGURE 3
GROUNDWATER ELEVATION MAP
OCTOBER 18, 2001

CDM



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PORTLAND, OREGON

FIGURE 4
GROUNDWATER ELEVATION MAP
APRIL 18, 2002

CDM


Linnton Oil Fire Training Grounds Soil Samples
November 14, 2002
November 7, 2003
June 30, 2004
LOFTG13
LOFTG12B
LOFTG12A
LOFTG6
LOFTG14
LOFTG11
LOFTG5
LOFTG10
LOFTG9
SOIL4
SOIL3
SOIL2
LOFTG8
LOFTG1
SOIL1
LOFTG7
0
150
300
feet
NORTH